

## Assignment 6

Title	Connectivity of Raspberry-Pi with Temperature Sensor
Problem statement / definition	Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated using LED's.
Learning objective	To understand the connectivity of Raspberry-Pi circuit with temperature sensor.
Learning outcome	The students will be able to <ul style="list-style-type: none"><li>• To interface temperature sensor to Raspberry-Pi.</li><li>• Read and analyze temperature values.</li><li>• Can perform actuation.</li></ul>
S/w packages & hardware apparatus used	Raspberry-Pi board, DHT-11 temperature sensor, LED, Raspian OS, Adafruit_DHT library.

### Theory: -

#### DHT11 humidity and temperature sensor -

This DHT11 temperature and humidity sensor features a temperature and humidity sensor complex with a calibrated digital output. By using the exclusive digital-signal acquisition technique and temperature and humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive type humidity measurement component and an NTC temperature measurement component and connects to a high performance 8-bit microcontroller offering excellent quality, fast response anti-referencing ability and cost effectiveness.

Each DHT11 element is strictly calibrated in laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programs in the OTP memory which are used by the sensor's internal single detection process. The single wire serial interface makes system integration quick and easy. Its small size, low power consumption, and up to 20m signal transmission make it the best choice for various applications, including the most demanding ones. The component is a 4-pin single row pin package. It is convenient to connect and special packages can be provided according to user requests.

The DHT11 contains a surface mounted NTC thermistor and a resistive humidity sensor. An IC on the back of the module converts the resistance measurements from the thermistor and humidity sensor into digital output of degree Celsius and relative humidity.

#### Basic Features: -

- Ultra-low cost.
- 3-5V power & I/O.
- 2.5mA current use during conversion.
- Good for 20-80% humidity readings with 5% accuracy.
- No more than 1Hz sampling rate (once every second).
- Body size 15.5mm \* 12mm \* 5.5mm.
- 4 pins with 0.1" spacing.

### Circuit Diagram: -

- $V_{cc}$  of DHT11 ---> 5V pin of Raspberry-Pi. 3
- GND of DHT11 ---> GND of Raspberry-Pi 3.
- Signal pin of DHT11 ---> GPIO4 pin of Raspberry-Pi 3.

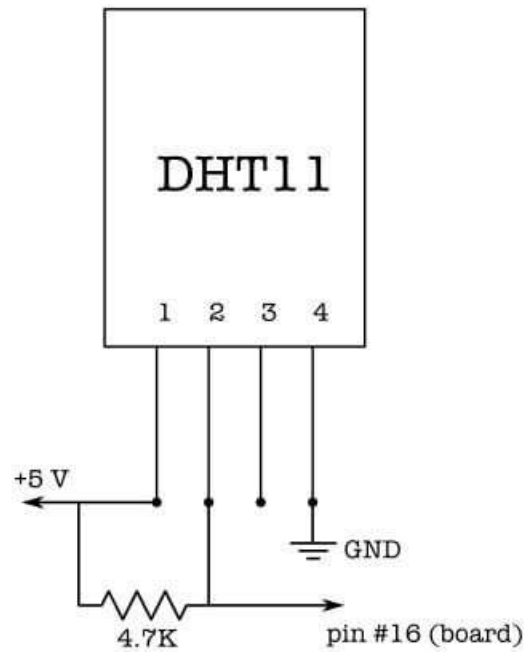


Fig. DHT-11

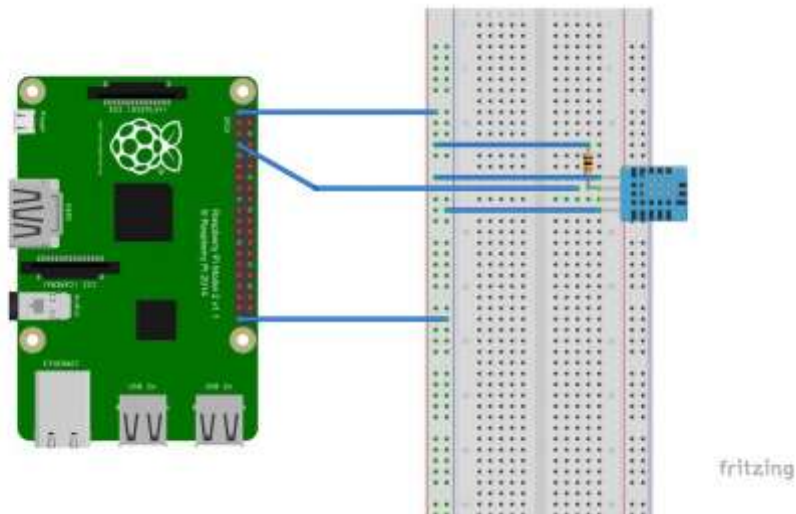


Fig. Connection with Raspberry-Pi 3

### Install AdaFruit DHT11 library: -

1. Clone the source code using  
`git clone https://github.com/adafruit/Adafruit\_python\_DHT.git`

2. Change directories with `cd Adafruit_python.DHT`
3. Install dependencies using  
`sudo apt-get install build-essential python-dev`
4. Install library with  
`sudo python setup.py install`

## Program

```
Import Adafruit_DHT
While True:
    hum, temp = Adafruit_DHT.read_retry(11, 4)
    print("Temperature: " + temp)
    print("Humidity" + hum)
```

## Conclusion

Successfully implemented the application to read the environment temperature and humidity.

- The temperature recorded was 25°C
- The humidity recorded was 18%.